The Peruvian tsunami of 23 June 2001: Preliminary report by the International Tsunami Survey Team

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Abstract. On 23 June 2001, at 20:33 BMT (15:33 local time), a large earthquake struck the southern provinces of Peru. With preliminary moments ranging from 1.2 to 4 times 10^{28} dyne cm, it could be the largest event recorded in more than 30 years. The last catastrophic earthquake in this region took place in 1942. The 2001 event resulted in a regionally destructive tsunami, which claimed 23 lives, with 62 more people still missing. In the aftermath of this disaster, a 12-member International Tsunami Survey Team was deployed and in the field area from 5 to 15 July 2001. The purpose of the expedition was to survey the tsunami damage, to record the testimony of witnesses and to hold a town meeting at Camana, on 13 July, which regrouped more than 250 residents. Our principal results were:

1. The area affected by the tsunami extends from Atico in the northwest to Ilo in the southeast, a distance of approximately 300 km along the coast. Maximum run-up was concentrated in the vicinity of Camana, where average values of 5 m, with peaks at 7 m were measured. Because of the flat topography of the Rio Camana Estuary, inundation distances were substantial, typically 200 to 700 m, and reached over 1 km at one location.

2. The tsunami consisted of a strong leading depression, reaching a vertical amplitude of −5 to −6 m, which was followed by a series of positive waves. The most reliable and consistent witnesses describe four waves, the third one being the largest. The downdraw was observed even in areas where no positive run-up was detected above the high-tide mark (e.g., west of Atico). The period of the phenomenon was unusually large, with the leading depression lasting for at least 15 min.

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3. Destruction by the tsunami is almost entirely concentrated in a section of coastline extending 15 km on either side of Camana. The agricultural fields in the Camana Estuary plain are covered with up to 40 cm of sand deposits, and the field infrastructure (irrigation canals, levies) has badly suffered. Most of the structures destroyed were located at the resort beach of La Punta, 10 km southeast of Camana. Poorly built adobe and infilled wall structures fared very poorly in the impacted area. A few structures built with stronger reinforcing and probably deeper foundations managed to withstand the brunt of the tsunami attack.

4. Casualties belong essentially to two social groups: farm workers caught unprepared by the wave (or who possibly did not heed their companions' evacuation orders), and house sitters and servants guarding beach houses during the winter season. A number of circumstances acted to reduce what could have been a much greater tragedy: the winter season, the low tide, and the time of the day. Had the tsunami occurred at high tide on a summer evening, when the beach at La Punta was bristling with vacationers patronizing food stands and discotheques, the death toll could easily have reached 1000; a different mechanism featuring no leading depression would have been even more disastrous.

5. Despite the 23 casualties, an impressive number of people told us of their run for the hills, mostly when they became aware of the downdraw. This is a positive attitude, proof of a good level of consciousness on the part of the population, a probable combination of ancestral heritage and a permanent effort at education. On the other hand, few residents seem to have reacted to the earthquake shaking, which conceivably might have saved the lives of farm workers with no direct view of the sea.